

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY  
WATER RESOURCES DIVISION  
DECEMBER 2013

STAFF REPORT

BIOLOGICAL AND CHEMICAL MONITORING IN THE  
MAPLE RIVER WATERSHED INCLUDING LAKE OVID  
CLINTON, GRATIOT, IONIA, AND MONTCALM COUNTIES, MICHIGAN  
APRIL TO SEPTEMBER 2012

## INTRODUCTION

Biological, chemical, and physical habitat conditions of the Maple River watershed in Clinton, Gratiot, Ionia, and Montcalm Counties were assessed by staff of the Surface Water Assessment Section (SWAS) from April to September 2012. The primary objectives of the assessments were to:

1. Evaluate the effectiveness of the Nonpoint Source (NPS) Program.
2. Assess the trophic status of Lake Ovid.
3. Assess the current status and condition of individual water bodies and determine if Michigan Water Quality Standards (WQS) are being met.

This document presents the results of the biological or chemical surveys performed at 33 stations within the Maple River watershed (Figure 1, Table 1). Two stations were monitored on Lake Ovid to determine the current trophic status of the lake and nutrient samples were collected upstream of the lake. Macroinvertebrate community, dissolved oxygen (DO), and *E. coli* monitoring were conducted on streams throughout the watershed to determine if WQS are being met.

Water samples were collected and preserved according to Michigan Department of Environmental Quality (MDEQ) protocol (Michigan Department of Natural Resources [MDNR], 1994). The macroinvertebrate community and physical habitat were qualitatively assessed using the SWAS Procedure 51 (MDEQ, 1990; Creal et al., 1996) for wadeable streams. The Maple River was sampled at four locations. Other streams assessed in this survey include: Baker Creek, Halterman Creek, Ferdon Drain, Pine Creek, North Shade Drain, Otter Creek, Fish Creek, Spaulding Drain, Muskrat Creek, Stony Creek, Hayworth Creek, St. Johns Big Ditch, Little Maple River, and Lake Ovid.

### Historical Watershed Information

The Maple River watershed encompasses approximately 970 square miles of predominantly agricultural land (Hanshue, 2002). The majority of the watershed is contained within the Southern Michigan Northern Indiana Till Plains (SMNITP) ecoregion, while the northeast corner of the watershed is located within the Huron Erie Lake Plains (HELP) ecoregion (Omernik and Gallant, 1988). Historic and ongoing dredging operations promote rapid drainage of water throughout most of the watershed. Many wetlands within the area have been drained to facilitate development and farming operations. The Upper Maple River (from the confluence of Hayworth Creek, upstream, including tributaries) has lost 82 percent of the wetland acres from

presettlement conditions. The historic wetlands would have stabilized the flow of water, removed suspended solids from the water, and recharged the groundwater.

The Maple River originates in the central portion of Shiawassee County. The river flows in a general northwesterly direction to Bannister where it changes directions and flows in a southwesterly direction until it converges with the Grand River in Muir. Fish Creek, a tributary to the Maple River, and all tributaries to Fish Creek are designated as coldwater streams. The rest of the streams within the Maple River watershed are designated as warmwater streams.

The 2007 survey in the Maple River watershed highlighted NPS pollution concerns at two locations: (1) Pine Creek, upstream of Hayes Road, was noted to have cattle accessing the river; and (2) Hayworth Creek was noted to have high nutrient concentrations. The 42 macroinvertebrate community scores ranged from excellent to poor and Procedure 51 habitat scores ranged from excellent to marginal (Holden, 2008). Sections of Pine Creek, Alder Creek, Lost Creek, Peet Creek, and two reaches of the Maple River have approved Total Maximum Daily Loads, but do not yet attain designated uses due to the presence of nuisance plant growths. The Upper Maple River Watershed Management Plan was approved in 2010 and identified impairments to the watershed and priority areas where NPS Best Management Practices could be implemented to improve water quality. The Clinton County Conservation District is currently working throughout the watershed to implement the watershed management plan.

## RESULTS

### Lake Ovid

Water quality monitoring was conducted in Lake Ovid in April and August 2012 following a request from the MDNR, Parks and Recreation Division. Lake Ovid is an impoundment of the Little Maple River and is located entirely within Sleepy Hollow State Park, which is managed by the MDNR. The Lake Ovid watershed is dominated by agricultural land use. Lake Ovid has historic documentation of being highly eutrophic, or nutrient enriched, as evidenced by algal blooms and high densities of aquatic macrophytes, including the invasive Eurasian Watermilfoil (*Myriophyllum spicatum*). The lake provides a variety of recreational uses including swimming, fishing, and no-wake boating. Unfortunately, the large quantity of milfoil has made fishing and boat navigation difficult. In 2006, the park implemented Eurasian Watermilfoil control using native watermilfoil weevils (*Euhrychiopsis lecontei*).

The 2012 Lake Ovid sampling results are presented in Tables 2 and 3. The late summer total phosphorus (TP) concentrations in Lake Ovid at the surface in 2012 (51 micrograms per liter [ug/l]) were lower than the concentrations observed in 2002 (63-76 ug/L), but are still indicative of a hypereutrophic lake. Using the summer surface phosphorus concentration, the summer secchi depth (0.7 feet), and the average chlorophyll a concentration (72 ug/L) results in an average Carlson TSI value of 72. Values greater than 61 are considered hypereutrophic (see Assessment Methodology, Chapter 4, in Goodwin et al., 2012). The chlorophyll a concentrations in 2012 (70-74 ug/L) were higher than the values observed in 2002 (54-62 ug/L). As in 2002, the spring concentrations of phosphorus were much lower than the summer values (spring TP between 25 and 28 ug/L; spring chlorophyll a value of 16 ug/L).

There were large beds of Eurasian watermilfoil present in the lake in August 2012. The lake was well mixed in the spring and moderately mixed in August. Despite the lack of a strong thermal stratification in late summer, there was evidence of oxygen depletion below 4 feet

(Table 3). Depth profiles found that in the first 4 feet of water, oxygen concentrations ranged from 11-13 milligrams per liter (mg/L), but from 6 feet down, the oxygen was approximately 2.5 mg/L. Storm events likely mix the lake intermittently throughout the summer and then oxygen depletion occurs to varying extents between mixes. The low oxygen levels from 6 to 14 feet would likely prohibit most fish from using this section of the lake. As indicated by the phosphorus concentrations at the bottom of the lake in August 2012, there was enough oxygen present in the water column to prevent phosphorus from being released from the sediments. The 2012 phosphorus data upstream of Lake Ovid on the Little Maple River (TP values ranging from 16-44 ug/L; Table 2) were consistent with data from Water Chemistry Monitoring Program sites on the Little Maple River, which found TP concentrations ranging from 25-49 ug/L.

## **Macroinvertebrate Community and Habitat Monitoring**

### *Procedure 51 Methods*

The macroinvertebrate communities at 16 stations were assessed and scored with metrics that rate the communities on a scale from excellent to poor (9 to -9). Stations with a score greater than or equal to +5 are considered excellent. Stations with a score less than or equal to -5 are classified as poor. Stations with a score of -4 through +4 are classified as acceptable. Habitat evaluations are based on 10 metrics, with a possible maximum total score of 200. Stations are classified as excellent with a habitat score >154, good with a score between 105 and 154, marginal with a score between 56 to 104, and poor with a score <56.

Stratified random and targeted selection methods were used to assess the Maple River watershed in 2012. A probabilistic monitoring approach, using stratified random site selection to address statewide and regional questions about water quality, was used to select several stations within the Maple River and Looking Glass River watersheds (MDEQ, 2014; draft). The Looking Glass River watershed biosurvey was conducted separately from the Maple River watershed biosurvey and is addressed in a separate report (Lipse, 2013). In addition to probabilistic monitoring, sites within the Maple River watershed were selected for targeted monitoring to fulfill specific monitoring requests, assess conditions before Best Management Practices installation, or collect information and assess attainment of designated uses from areas where historic information was lacking.

### *Procedure 51 Results*

#### Macroinvertebrate Community

The macroinvertebrate community was sampled and scored using Procedure 51 at 16 streams (Table 1). Results indicate that macroinvertebrate communities rated excellent at 3 sites, acceptable at 12 sites, and poor at 1 site (Tables 4a and 4b). The excellent, high quality macroinvertebrate communities were found at Fish Creek, downstream of Hubbardston (Station 12), Muskrat Creek at Dexter Trail (Station 14), and Stony Creek at Stony Creek Road (Station 16). The acceptable rating stations had scores ranging from -4 to +4. The stations with positive (0-4) scores (Stations 1, 7, 8, 10, 11, 13, and 15) generally had a higher number of mayfly and caddisfly taxa and individual organisms. The stations with lower acceptable scores in the negative range from -1 to -4 (Stations 2, 3, 5, and 9) had lower numbers of individual mayfly and caddisfly individuals and were more likely to be heavily dominated by one taxa. The only site to score poor was Pine Creek at Hayes Road (Station 6), upstream of the confluence with North Shade Drain, where only one individual mayfly was counted, no caddisfly individuals were collected, and the community was dominated by flatworms and had a high proportion of

surface breathing organisms. The likely reason for this impairment is cattle access, as described under “NPS Effectiveness” below.

### Habitat

Habitat in 16 wadeable streams was sampled and scored using Procedure 51 (Table 1). Results indicate that habitat rated good at 5 sites and ‘marginal’ at 11 sites (Table 5). The streams with good habitat generally had more in-stream cover and substrate for macroinvertebrates and were less likely to have been altered through dredging. However, almost all of the sites appeared to have been altered at some point historically. There were no stations with poor habitat ratings, but several stations had multiple individual metrics score in the poor range. Pine Creek at Pierce Road (Station 5) scored 2 points above the poor category and had 6 of the 14 metrics rank in the individual metric poor category. Pine Creek at Hayes Road (Station 6) and Halterman Creek at Wilson Road (Station 3) also had 6 and 4 individual metrics rank in the poor category, respectively. Across all of the sites there were 5 sites with minimal riparian zone widths scoring poor, 5 sites with 1 or more substrate and in-stream cover metrics in the poor range, and 7 sites with 1 or more channel morphology metrics in the poor range. Most of the poor scores for individual metrics are a result of historic or ongoing dredging.

### **DO Monitoring**

The upper portion of the Hayworth Creek watershed was monitored for DO in the summer of 2012. This monitoring was conducted as a follow-up to a 2001 study that was inconclusive and fraught with flooding and mechanical problems. The 2001 study showed DO levels in the St. Johns Big Ditch that were borderline in attaining the minimum warmwater DO WQS of 5.0 mg/l.

DO monitoring was conducted in the morning and evening on July 31, 2012, at the locations listed in Table 6. The purpose of the monitoring was to collect current site-specific DO concentrations and diurnal variation data, during or near the critical season, to see if the WQS was met.

As seen in Table 6, there was a morning sample on West Colony Road that was below 5.0 mg/l. It would be desirable to deploy sondes for long-term data collection on West Colony Road, to better assess the frequency and magnitude of DO WQS violations. Additional instantaneous sampling could be conducted throughout the watershed downstream of West Colony Road to identify if there are continuing issues downstream of upper Hayworth Creek.

### ***E. coli* Monitoring**

Rule 62 (R 323.1062) of the Part 4 rules, WQS, promulgated under Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended, states that all waters of the state protected for total body contact recreation shall not contain more than 130 *E. coli* per 100 milliliters (mL), as a 30-day geometric mean; and at no time shall the waters of the state protected for total body contact recreation contain more than a maximum of 300 *E. coli* per 100 mL. *E. coli* was monitored weekly for 5 weeks at 6 stations (Table 7) in the Maple River watershed. Individual daily and 30-day geometric mean concentrations ranged from 85 to 3,902 and 211 to 512 *E. coli*/100 mL, respectively. All stations exceeded the 30-day geometric mean (130 *E. coli*/100 mL) and had at least 2 exceedances of the daily geometric mean (300 *E. coli*/100 mL) Total Body Contact standard. Maple River at Shepardsville and Nickel Plate Roads and Fish Creek at Fenwick Road exceeded the daily

geometric mean Total Body Contact standard on every sampling event.

### **NPS Effectiveness**

Pine Creek at Hayes Road (Station 6) received a poor Procedure 51 macroinvertebrate community score. This site is in an area where cattle have open access to the stream. Problems with cattle access at this location have been noted since 2006 (Holden, 2008). Through an NPS Program Section 319 implementation grant, the Clinton Conservation District is attempting to work with the landowner to add a section of fence to keep cattle out of most of the stream. Cattle in the stream are continually causing bank erosion and substrate disturbance. Future surveys after the cattle are excluded from the section of the stream will evaluate the impact of the exclusion on the macroinvertebrate community.

### **SUMMARY**

Much of the Maple River watershed has been modified through stream dredging to promote drainage of agricultural lands. The watershed was once part of a glacial lake bed and generally has very low gradient (Hanshue and Harrington, 2011). Water quality throughout the watershed is impacted by agricultural runoff, nutrient enrichment, and habitat degradation associated with channelization. The results of the 2012 survey align with the general large-scale watershed issues. Lake Ovid continues to be classified as hypereutrophic, or rich in nutrients, and has intermittent oxygen depletion in much of the lake. The Procedure 51 the macroinvertebrate community scores in the Maple River watershed range from excellent to poor with many low scoring sites in channelized, dredged agricultural streams. There are WQS exceedances due to low DO levels in the upper portion of Hayworth Creek, a poor macroinvertebrate community in Pine Creek likely due to cattle access to the stream, and elevated *E. coli* concentrations throughout the watershed.

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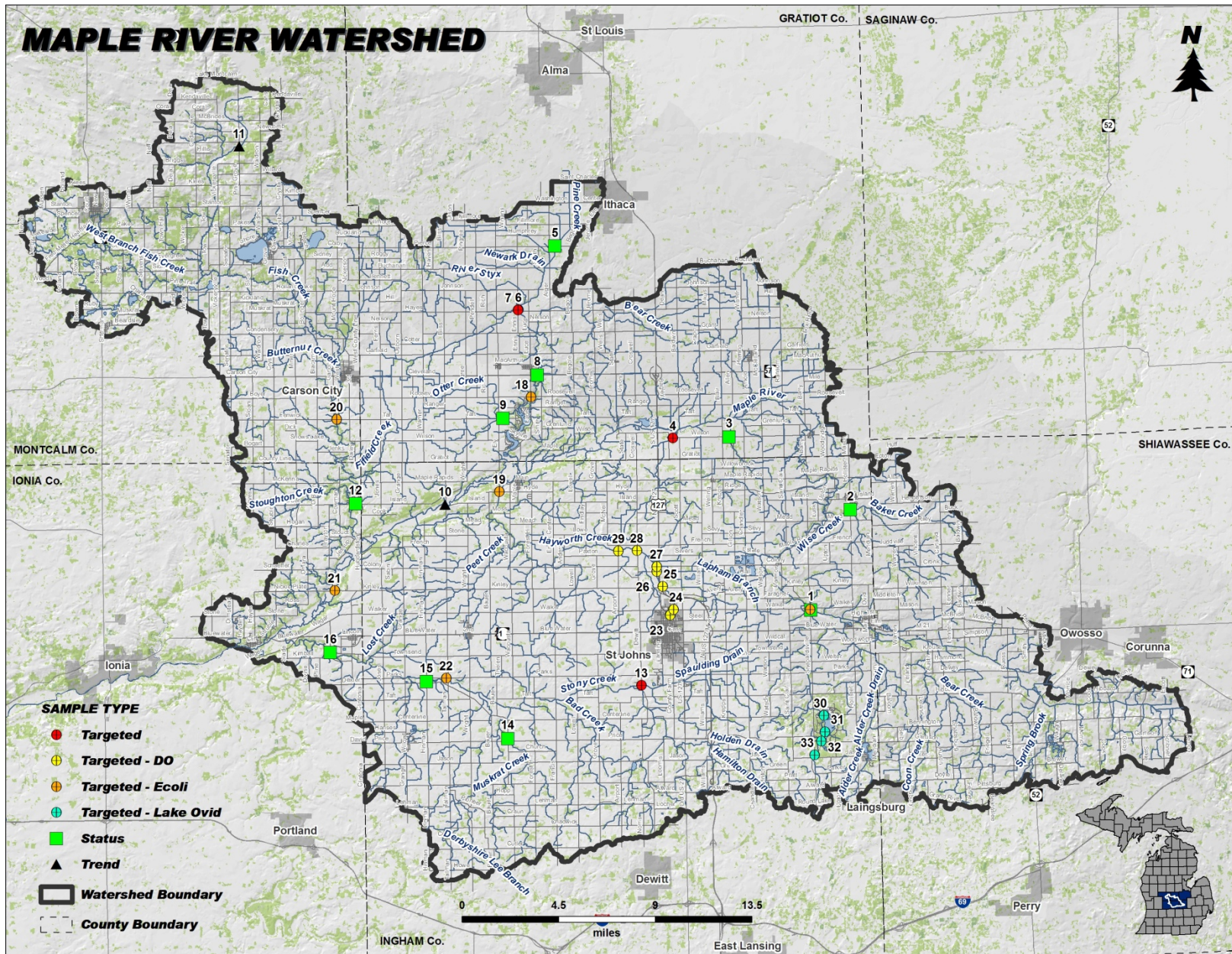


Figure 1. Maple River watershed sampling locations, 2012.

Table 1. Monitoring locations in the Maple River watershed, 2012. Habitat and macroinvertebrate surveys were conducted at Stations 1-16, *E. coli* was monitored at Stations 17-22, DO was monitored at Stations 23-29, and nutrient/lake monitoring was conducted at Stations 30-33.

Site #	Site Type	Water Body	Location	Latitude	Longitude	County	Habitat		Macroinvertebrates	
							Rating	Score	Rating	Score
1	Status	Maple River	Shepardsville Road	43.01430	-84.42530	Clinton	Marginal	96	Acceptable	3
2	Status	Baker Creek	Ovid Street	43.08134	-84.38710	Clinton	Good	105	Acceptable	-4
3	Status	Halterman Creek	Wilson Road	43.13201	-84.49745	Gratiot	Marginal	70	Acceptable	-1
4	Targeted	Ferdon Drain	Wilson Road	43.13205	-84.54910	Gratiot	Marginal	99	Acceptable	-4
5	Status	Pine Creek	Pierce Road	43.26276	-84.65493	Gratiot	Marginal	57	Acceptable	-2
6	Targeted	Pine Creek	Hayes Road (upstream of N Shade Confluence)	43.22024	-84.68941	Gratiot	Marginal	60	Poor	-5
7	Targeted	North Shade Drain	Ennis Road	43.21992	-84.68969	Gratiot	Marginal	81	Acceptable	0
8	Status	Pine Creek	M57	43.17611	-84.67304	Gratiot	Good	122	Acceptable	3
9	Status	Otter Creek	Taft Road	43.14713	-84.70511	Gratiot	Marginal	102	Acceptable	-3
10	Trend	Maple River	Tallman Road	43.08950	-84.75960	Clinton	Good	120	Acceptable	1
11	Trend	Fish Creek	Pine Grove Road	43.33310	-84.94480	Montcalm	Marginal	104	Acceptable	1
12	Status	Fish Creek	South of Hubbardston	43.09101	-84.84214	Ionia	Good	123	Excellent	7
13	Targeted	Spaulding Drain	Dewitt Road	42.96560	-84.58201	Clinton	Marginal	63	Acceptable	1
14	Status	Muskrat Creek	Dexter Trail (north)	42.93106	-84.70537	Clinton	Marginal	100	Excellent	5
15	Status	Stony Creek	Hinman Road	42.97026	-84.77925	Clinton	Marginal	82	Acceptable	1
16	Status	Stony Creek	End of Stony Creek Road	42.99086	-84.86714	Ionia	Good	147	Excellent	6
17	Targeted - <i>E. coli</i>	Maple River	Shepardsville Road	43.01440	-84.42569	Clinton				
18	Targeted - <i>E. coli</i>	Pine Creek	Luce Road	43.16116	-84.67924	Clinton				
19	Targeted - <i>E. coli</i>	Hayworth Creek	Hyde Road	43.09757	-84.70964	Clinton				
20	Targeted - <i>E. coli</i>	Fish Creek	Fenwick Road	43.14802	-84.85843	Montcalm				
21	Targeted - <i>E. coli</i>	Maple River	Nickel Plate Road	43.03264	-84.86217	Ionia				
22	Targeted - <i>E. coli</i>	Stony Creek	Downstream Tallman Road	42.97253	-84.76091	Clinton				
23	Targeted - DO	St. Johns Big Ditch	Downstream Old US 27	43.01237	-84.55430	Clinton				
24	Targeted - DO	St. Johns Big Ditch	W. Walker Road	43.01612	-84.55125	Clinton				
25	Targeted - DO	St. Johns Big Ditch	W. Kinley/Old US 27	43.03185	-84.56095	Clinton				
26	Targeted - DO	St. Johns Big Ditch	Livingston	43.04199	-84.56609	Clinton				
27	Targeted - DO	St. Johns Big Ditch	W. Colony Road	43.04536	-84.56613	Clinton				
28	Targeted - DO	Hayworth Creek	N. DeWitt Road	43.05644	-84.58381	Clinton				
29	Targeted - DO	Hayworth Creek	N. Airport Road	43.05644	-84.60122	Clinton				
30	Targeted - Lake Ovid	Lake Ovid	North Basin	42.94286	-84.41496	Clinton				
31	Targeted - Lake Ovid	Lake Ovid	South Basin	42.93180	-84.41440	Clinton				
32	Targeted - Lake Ovid	Little Maple River	Price Road	42.92562	-84.41798	Clinton				
33	Targeted - Lake Ovid	Little Maple River	Shepardsville Road	42.91636	-84.42437	Clinton				



Table 2. Water chemistry data from Lake Ovid and the Little Maple River upstream of Lake Ovid, April and August 2012.

SPRING 4/25/2012		Station 30 Lake Ovid-1 Surface	Station 30 Lake Ovid-1 Bottom	Station 31 Lake Ovid-2 Surface	Station 31 Lake Ovid-2 Bottom	Station 32 Little Maple River u/s Price Road	Station 33 Little Maple River @ Shepardsville Rd.
Ammonia	mg/L	ND	ND	ND	--	ND	ND
Chlorophyll	µg/L	16	--	--	--	--	--
Nitrate - Calculated	mg/L	0.089	0.089	0.074	--	ND	0.36
Nitrate + Nitrite	mg/L	0.095	0.095	0.08	--	ND	0.364
Nitrite	mg/L	0.006	0.006	0.006	--	0.004	0.008
Ortho-phosphate	mg/L	0.003	0.003	0.003	--	0.003	0.007
Solids - Suspended	mg/L	6	4	5	--	6	ND
Total Kjeldahl Nitro	mg/L	1	1.01	1.06	--	1.16	0.85
Total Phosphorus	mg/L	0.025	0.027	0.028	--	0.033	0.016
SUMMER 8/16/2012		Station 30 Lake Ovid-1 Surface	Station 30 Lake Ovid-1 Bottom	Station 31 Lake Ovid-2 Surface	Station 31 Lake Ovid-2 Bottom	Station 32 Little Maple River u/s Price Road	Station 33 Little Maple River @ Shepardsville Rd.
Ammonia	mg/L	0.003	0.297	0.011	0.059	0.06	0.014
Chlorophyll	µg/L	74	--	70	--	--	--
Nitrate - Calculated	mg/L	ND	ND	ND	ND	ND	0.33
Nitrate + Nitrite	mg/L	ND	ND	ND	ND	ND	0.333
Nitrite	mg/L	0.005	0.004	0.004	0.005	0.005	0.008
Ortho-phosphate	mg/L	0.008	0.008	0.007	0.007	0.006	0.013
Solids - Suspended	mg/L	7	4	6	ND	ND	18
Total Kjeldahl Nitro	mg/L	1.56	1.35	1.57	1.14	1.32	0.42
Total Phosphorus	mg/L	0.051	0.039	0.051	0.038	0.044	0.035

Table 3. Depth profile data from Lake Ovid, Clinton County, April and August 2012.

Station	Depth (feet)	Temperature (F)	DO (mg/L)	Conductivity (umho/cm)	pH
<b>SPRING</b>					
Lake Ovid- North Basin	0	53.7	13.1	--	--
Sample Date: April 25, 2012	3	53.2	13.1	--	--
Station 30- 10:20 a.m.	5	53.2	12.9	--	--
Station Depth: 15 feet	7	53.1	12.8	--	--
Secchi Depth: 6 feet	9	53	12.7	--	--
	11	53	12.5	--	--
	12	53	12.5	--	--
	13	53	12.4	--	--
<b>SUMMER</b>					
Lake Ovid- North Basin	0	73.7	13.6	295	9.2
Sample Date: August 16, 2012	2	73.7	13.1	295	9.3
Station 30- 9:45 a.m.	4	73.2	10.9	297	9.1
Station Depth: 15 feet	6	71.4	2.4	310	8.1
Secchi Depth: 0.7 feet	8	71.1	2.2	311	7.8
	10	71.1	2.6	311	7.7
	12	70.9	2.8	312	7.7
	13	70.9	2.9	314	7.7
	14	70.7	2.9	315	7.7
<hr/>					
Lake Ovid- South Basin	0	72.4	9.2	301	8.9
Sample Date: August 16, 2012	2	72.4	9.2	302	8.9
Station 31- 10:20 am	4	72.3	8.9	302	8.9
Station Depth: 11 feet	6	72	7.9	304	8.8
Secchi Depth: 0.7 feet	8	71.4	4.6	314	7.8
	10	70.4	1.4	333	7.6

Table 4A. Qualitative macroinvertebrate sampling results for the Maple River, 2012.

TAXA	Maple River	Baker Creek	Halterman	Ferdon Drain
	Shepardsville Road 9/13/2012 STATION 1	Ovid Street 9/13/2012 STATION 2	Wilson Road 7/10/2012 STATION 3	Wilson Road 9/13/2012 STATION 4
PLATYHELMINTHES (flatworms)				
Turbellaria	1	8	1	6
ANNELIDA (segmented worms)				
Hirudinea (leeches)		4	4	3
Oligochaeta (worms)	3	16	32	7
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	90	12	3	35
Decapoda (crayfish)		1		1
Isopoda (sowbugs)	1	1		4
Arachnoidea				
Hydracarina	4	1	1	
Insecta				
Ephemeroptera (mayflies)				
Baetiscidae	28			
Baetidae	17		1	12
Caenidae				1
Ephemeridae	9			
Heptageniidae	9			
Odonata				
Anisoptera (dragonflies)				
Aeshnidae	3	2	1	2
Gomphidae	6			
Libellulidae	1			2
Zygoptera (damselflies)				
Calopterygidae	6	10		44
Coenagrionidae	8	2	18	20
Lestidae				
Hemiptera (true bugs)				
Belostomatidae		1	2	1
Corixidae	2		3	105
Gerridae	1	1	3	2
Mesoveliidae				2
Nepidae	1			1
Notonectidae			1	1
Pleidae				1
Veliidae	2			1
Megaloptera				
Sialidae (alder flies)	1			3
Trichoptera (caddisflies)				
Brachycentridae	1			
Helicopsychidae	1			
Hydropsychidae	53	6		1
Hydroptilidae			2	
Leptoceridae	1	7	29	
Limnephilidae			1	
Philopotamidae			1	

<b>TAXA</b>	<b>STATION 1</b>	<b>STATION 2</b>	<b>STATION 3</b>	<b>STATION 4</b>
Phryganeidae		1		
Polycentropodidae		1		
Coleoptera (beetles)				
Dytiscidae (total)			1	1
Gyrinidae (adults)			1	1
Halplidae (adults)			1	2
Hydrophilidae (total)			1	
Elmidae	29	89	12	12
Halplidae (larvae)			2	
Diptera (flies)				
Athericidae			1	
Chironomidae	68	56	40	24
Dixidae			3	
Simuliidae				33
Tabanidae	8	7		4
Tipulidae		5	2	
MOLLUSCA				
Gastropoda (snails)				
Ancylidae (limpets)	2	1		1
Hydrobiidae			1	
Lymnaeidae			1	
Physidae	7	32	181	14
Planorbidae	1			1
Pelecypoda (bivalves)				
Corbiculidae	1			1
Sphaeriidae (clams)	4	4	6	
<b>TOTAL INDIVIDUALS</b>	<b>383</b>	<b>268</b>	<b>356</b>	<b>349</b>

Table 4B. Macroinvertebrate metric evaluation of the Maple River watershed, 2012.

<b>METRIC</b>	<b>Maple River</b>		<b>Baker Creek</b>		<b>Halterman Creek</b>		<b>Ferdon Drain</b>	
	<b>Value</b>	<b>Score</b>	<b>Value</b>	<b>Score</b>	<b>Value</b>	<b>Score</b>	<b>Value</b>	<b>Score</b>
<b>TOTAL NUMBER OF TAXA</b>	32	1	23	0	29	1	33	1
<b>NUMBER OF MAYFLY TAXA</b>	5	1	0	-1	1	0	2	1
<b>NUMBER OF CADDISFLY TAXA</b>	4	1	4	1	4	1	1	-1
<b>NUMBER OF STONEFLY TAXA</b>	0	-1	0	-1	0	-1	0	-1
<b>PERCENT MAYFLY COMP.</b>	20.10	0	0.00	-1	0.28	-1	3.72	-1
<b>PERCENT CADDISFLY COMP.</b>	14.62	0	5.60	0	9.27	0	0.29	-1
<b>PERCENT DOMINANT TAXON</b>	23.50	-1	33.21	-1	50.84	-1	30.09	-1
<b>PERCENT ISOPOD, SNAIL, LEECH</b>	2.87	1	14.18	-1	52.53	-1	6.59	0
<b>PERCENT SURF. AIR BREATHERS</b>	1.57	1	0.75	1	3.65	1	33.81	-1
<b>TOTAL SCORE</b>		3		-3		-1		-4
<b>MACROINV. COMMUNITY RATING</b>		<b>ACCEPT.</b>		<b>ACCEPT.</b>		<b>ACCEPT.</b>		<b>ACCEPT.</b>

Table 4A cont. Qualitative macroinvertebrate sampling results for the Maple River watershed, 2012.

TAXA	Pine Creek Pierce Road 8/29/2012 STATION 5	Pine Creek Hayes Road 8/29/2012 STATION 6	North Shade Drain Ennis Road 8/29/2012 STATION 7	Pine Creek M57 7/10/2012 STATION 8
PLATYHELMINTHES (flatworms)				
Turbellaria	29	132	56	1
ANNELIDA (segmented worms)				
Hirudinea (leeches)	13		2	1
Oligochaeta (worms)	58	32	29	3
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	107	17		17
Decapoda (crayfish)				1
Isopoda (sowbugs)	12	1		3
Arachnoidea				
Hydracarina	3	12	6	
Insecta				
Ephemeroptera (mayflies)				
Baetidae	3	1	2	13
Caenidae	3		11	
Heptageniidae				7
Odonata				
Anisoptera (dragonflies)				
Aeshnidae		1	2	4
Gomphidae		1		
Libellulidae		2	23	
Zygoptera (damselflies)				
Calopterygidae				4
Coenagrionidae	14	35	88	
Hemiptera (true bugs)				
Belostomatidae		2	1	
Corixidae	1	1	2	13
Gerridae				2
Nepidae			1	
Notonectidae		1	1	
Pleidae	1			
Megaloptera				
Sialidae (alder flies)				1
Trichoptera (caddisflies)				
Helicopsychidae				11
Hydropsychidae				125
Leptoceridae			5	36
Limnephilidae				1
Philopotamidae				1
Phryganeidae			1	
Coleoptera (beetles)				
Dytiscidae (total)		2	1	
Haliplidae (adults)	13	38	13	
Hydrophilidae (total)	1	1		
Dryopidae				1
Elmidae		6	11	42
Haliplidae (larvae)		19	32	
Psephenidae (larvae)				1
Diptera (flies)				



<b>TAXA</b>	<b>STATION 5</b>	<b>STATION 6</b>	<b>STATION 7</b>	<b>STATION 8</b>
Ceratopogonidae	1	1	1	
Chironomidae	6	6	30	48
Culicidae			1	
Simuliidae				1
Tabanidae			1	
Tipulidae				3
<b>MOLLUSCA</b>				
Gastropoda (snails)				
Physidae		2		24
Pleuroceridae				1
Pomatiopsidae			1	
Pelecypoda (bivalves)				
Sphaeriidae (clams)	1	1	18	2
<b>TOTAL INDIVIDUALS</b>	<b>266</b>	<b>314</b>	<b>339</b>	<b>367</b>

Table 4B cont. Macroinvertebrate metric evaluation of the Maple River watershed, 2012.

<b>METRIC</b>	<b>Pine Creek</b>		<b>Pine Creek</b>		<b>North Shade Drain</b>		<b>Pine Creek</b>	
	<b>Pierce Road</b>		<b>Hayes Road</b>		<b>Ennis Road</b>		<b>M57</b>	
	<b>8/29/2012</b>		<b>8/29/2012</b>		<b>8/29/2012</b>		<b>7/10/2012</b>	
	<b>STATION 5</b>		<b>STATION 6</b>		<b>STATION 7</b>		<b>STATION 8</b>	
	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	16	1	21	0	24	0	27	1
NUMBER OF MAYFLY TAXA	2	1	1	-1	2	0	2	0
NUMBER OF CADDISFLY TAXA	0	-1	0	-1	2	0	5	1
NUMBER OF STONEFLY TAXA	0	-1	0	-1	0	-1	0	-1
PERCENT MAYFLY COMP.	2.26	-1	0.32	-1	3.83	0	5.45	0
PERCENT CADDISFLY COMP.	0.00	-1	0.00	-1	1.77	-1	47.41	1
PERCENT DOMINANT TAXON	40.23	-1	42.04	-1	25.96	0	34.06	0
PERCENT ISOPOD, SNAIL, LEECH	9.40	0	0.96	1	0.88	1	7.90	0
PERCENT SURF. AIR BREATHERS	6.02	1	14.33	0	5.90	1	4.09	1
<b>TOTAL SCORE</b>		<b>-2</b>		<b>-5</b>		<b>0</b>		<b>3</b>
<b>MACROINV. COMMUNITY RATING</b>		<b>ACCEPT.</b>		<b>POOR</b>		<b>ACCEPT.</b>		<b>ACCEPT.</b>

Table 4A cont. Qualitative macroinvertebrate sampling results for the Maple River watershed, 2012.

TAXA	Otter Creek Taft Road 7/10/2012 STATION 9	Maple River Tallman Road 7/31/2012 STATION 10	Fish Creek Pine Grove Road 7/31/2012 STATION 11	Fish Creek south of Hubbardston 8/29/2012 STATION 12
PORIFERA (sponges)				1
ANNELIDA (segmented worms)				
Hirudinea (leeches)	1		1	
Oligochaeta (worms)	2	1	2	2
ARTHROPODA				
Crustacea				
Amphipoda (scuds)		14	73	6
Decapoda (crayfish)	1		2	1
Isopoda (sowbugs)				1
Arachnoidea				
Hydracarina		1	1	3
Insecta				
Ephemeroptera (mayflies)				
Baetidae		7	4	11
Caenidae		11		12
Ephemerellidae			1	
Ephemeridae		1	1	
Heptageniidae		12		33
Isonychiidae				11
Tricorythidae			1	8
Odonata				
Anisoptera (dragonflies)				
Aeshnidae		1	1	3
Gomphidae				7
Zygoptera (damselflies)				
Calopterygidae	2	12	8	6
Coenagrionidae		49	8	9
Plecoptera (stoneflies)				
Perlidae				5
Pteronarcyidae				1
Hemiptera (true bugs)				
Belostomatidae		2	1	
Corixidae	1	120	1	
Gerridae	1	8	1	1
Mesoveliidae			2	
Nepidae			1	
Notonectidae	1	3		
Megaloptera				
Corydalidae (dobson flies)		1		5
Sialidae (alder flies)			14	3
Trichoptera (caddisflies)				
Brachycentridae			5	6
Hydropsychidae	4	2	12	20
Hydroptilidae		3	2	
Leptoceridae	2	3	8	3
Limnephilidae				1
Polycentropodidae		8		
Coleoptera (beetles)				
Gyrinidae (adults)			1	
Halplidae (adults)		1	1	

<b>TAXA</b>	<b>STATION 9</b>	<b>STATION 10</b>	<b>STATION 11</b>	<b>STATION 12</b>
Hydrophilidae (total)			1	
Scirtidae (adults)		1		
Elmidae	5	23	19	46
Gyrinidae (larvae)		2		
Psephenidae (larvae)				3
Diptera (flies)				
Athericidae				2
Ceratopogonidae	1	3	1	
Chironomidae	240	48	55	26
Dixidae	1		1	
Simuliidae				1
Tabanidae		2	2	1
Tipulidae	1			
<b>MOLLUSCA</b>				
Gastropoda (snails)				
Ancylidae (limpets)			1	2
Bithyniidae				2
Physidae	5	2	15	
Planorbidae		2	2	
Pelecypoda (bivalves)				
Sphaeriidae (clams)		1	15	4
<b>TOTAL INDIVIDUALS</b>	<b>268</b>	<b>344</b>	<b>264</b>	<b>246</b>

Table 4B cont. Macroinvertebrate metric evaluation of the Maple River watershed, 2012.

<b>METRIC</b>	<b>Otter Creek Taft Road</b>		<b>Maple River Tallman Road</b>		<b>Fish Creek Pine Grove Road</b>		<b>Fish Creek south of Hubbardston</b>	
	<b>7/10/2012 STATION 9</b>		<b>7/31/2012 STATION 10</b>		<b>7/31/2012 STATION 11</b>		<b>8/29/2012 STATION 12</b>	
	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	15	0	29	1	34	1	33	1
NUMBER OF MAYFLY TAXA	0	-1	4	1	4	1	5	1
NUMBER OF CADDISFLY TAXA	2	0	4	0	4	0	4	0
NUMBER OF STONEFLY TAXA	0	-1	0	-1	0	-1	2	1
PERCENT MAYFLY COMP.	0.00	-1	9.01	0	2.65	-1	30.49	1
PERCENT CADDISFLY COMP.	2.24	-1	4.65	0	10.23	0	12.20	0
PERCENT DOMINANT TAXON	89.55	-1	34.88	0	27.65	0	18.70	1
PERCENT ISOPOD, SNAIL, LEECH	2.24	1	1.16	1	7.20	0	2.03	1
PERCENT SURF. AIR BREATHERS	1.12	1	39.24	-1	3.41	1	0.41	1
<b>TOTAL SCORE</b>		<b>-3</b>		<b>1</b>		<b>1</b>		<b>7</b>
<b>MACROINV. COMMUNITY RATING</b>		<b>ACCEPT.</b>		<b>ACCEPT.</b>		<b>ACCEPT.</b>		<b>EXCELLENT</b>

Table 4A cont. Qualitative macroinvertebrate sampling results for the Maple River watershed, 2012.

<b>TAXA</b>	<b>Spaulding Creek Dewitt Road 7/11/2012 STATION 13</b>	<b>Muskrat Creek Dexter Trail (north of Price Rd) 7/11/2012 STATION 14</b>	<b>Stony Creek Hinman Road 7/11/2012 STATION 15</b>	<b>Stony Creek Stony Creek Road 7/11/2012 STATION 16</b>
<b>PLATYHELMINTHES (flatworms)</b>				
Turbellaria	38	3		
<b>ANNELIDA (segmented worms)</b>				
Hirudinea (leeches)	14	3		
Oligochaeta (worms)	40	7	73	1
<b>ARTHROPODA</b>				
<b>Crustacea</b>				
Amphipoda (scuds)		30	1	19
Decapoda (crayfish)	1	1	1	7
Isopoda (sowbugs)	1	1		1
<b>Arachnoidea</b>				
Hydracarina	6	1	1	1
<b>Insecta</b>				
<b>Ephemeroptera (mayflies)</b>				
Baetidae	2	26	10	8
Caenidae	78	50	6	9
Ephemerellidae			4	1
Ephemeridae			1	2
Heptageniidae	1	6	24	50
Isonychiidae			3	22
Tricorythidae		1	17	1
<b>Odonata</b>				
<b>Anisoptera (dragonflies)</b>				
Aeshnidae	1		1	4
Gomphidae	1	1	1	3
Libellulidae	1		3	1
<b>Zygoptera (damselflies)</b>				
Calopterygidae	1	6	1	1
Coenagrionidae	21	14	5	3
<b>Plecoptera (stoneflies)</b>				
Perlidae				1
<b>Hemiptera (true bugs)</b>				
Belostomatidae			2	
Corixidae	1	1	3	1
Gerridae	1	1	1	6
Mesoveliidae		1		
Nepidae	1		1	
Notonectidae			1	1
Veliidae				24
<b>Megaloptera</b>				
Corydalidae (dobson flies)				1
Sialidae (alder flies)	1	1	1	
<b>Trichoptera (caddisflies)</b>				
Brachycentridae				1
Helicopsychidae			8	
Hydropsychidae		22	24	40
Hydroptilidae	11	1	11	
Leptoceridae	7	1	13	2
Limnephilidae		1		1
Philopotamidae	1	1		11

<b>TAXA</b>	<b>STATION 13</b>	<b>STATION 14</b>	<b>STATION 15</b>	<b>STATION 16</b>
Coleoptera (beetles)				
Gyrinidae (adults)			1	1
Haliplidae (adults)	4	3	13	1
Hydrophilidae (total)	1			
Elmidae	26	22	18	3
Gyrinidae (larvae)	1			1
Haliplidae (larvae)	1		1	
Psephenidae (larvae)				3
Diptera (flies)				
Athericidae		1	3	21
Ceratopogonidae	2	1	2	
Chironomidae	19	84	29	9
Simuliidae		8	4	
Stratiomyidae			1	
Tipulidae		2	1	2
MOLLUSCA				
Gastropoda (snails)				
Hydrobiidae	17	1	4	
Lymnaeidae				1
Physidae	12	4	46	10
Planorbidae	12	1		
Pleuroceridae				1
Viviparidae	1			
Pelecypoda (bivalves)				
Sphaeriidae (clams)	5	1	19	1
Unionidae (mussels)			3	
<b>TOTAL INDIVIDUALS</b>	<b>330</b>	<b>308</b>	<b>362</b>	<b>277</b>

Table 4B cont. Macroinvertebrate metric evaluation of the Maple River watershed, 2012.

<b>METRIC</b>	<b>Spaulding Creek</b>		<b>Muskrat Creek Dexter Trail (north of Price Rd)</b>		<b>Stony Creek Hinman Road</b>		<b>Stony Creek Stony Creek Road</b>	
	<b>Value</b>	<b>Score</b>	<b>Value</b>	<b>Score</b>	<b>Value</b>	<b>Score</b>	<b>Value</b>	<b>Score</b>
	<b>STATION 13</b>		<b>STATION 14</b>		<b>STATION 15</b>		<b>STATION 16</b>	
TOTAL NUMBER OF TAXA	32	1	34	1	39	1	39	1
NUMBER OF MAYFLY TAXA	3	0	4	1	7	1	7	1
NUMBER OF CADDISFLY TAXA	3	0	5	1	4	0	5	1
NUMBER OF STONEFLY TAXA	0	-1	0	-1	0	-1	1	1
PERCENT MAYFLY COMP.	24.55	1	26.95	1	17.96	0	33.57	1
PERCENT CADDISFLY COMP.	5.76	0	8.44	0	15.47	0	19.86	0
PERCENT DOMINANT TAXON	23.64	0	27.27	0	20.17	0	18.05	1
PERCENT ISOPOD, SNAIL, LEECH	17.27	-1	3.25	1	13.81	-1	4.69	0
PERCENT SURF. AIR BREATHERS	2.42	1	1.95	1	6.35	1	12.27	0
<b>TOTAL SCORE</b>		<b>1</b>		<b>5</b>		<b>1</b>		<b>6</b>
<b>MACROINV. COMMUNITY RATING</b>		<b>ACCEPT.</b>		<b>EXCELLENT</b>		<b>ACCEPT.</b>		<b>EXCELLENT</b>



Table 5. Habitat evaluation for the Maple River watershed, 2012.

	Maple River	Baker Creek	Halterman Creek	Ferdon Drain	Pine Creek
	Shepardsville Rd GLIDE/POOL STATION 1	Ovid Street RIFFLE/RUN STATION 2	Wilson Road GLIDE/POOL STATION 3	Wilson Road RIFFLE/RUN STATION 4	Pierce Road GLIDE/POOL STATION 5
HABITAT METRIC					
<b>Substrate and Instream Cover</b>					
Epifaunal Substrate/ Avail Cover (20)	8	14	5	7	3
Embeddedness (20)*		10		6	
Velocity/Depth Regime (20)*		10		14	
Pool Substrate Characterization (20)**	9		7		6
Pool Variability (20)**	6		3		3
<b>Channel Morphology</b>					
Sediment Deposition (20)	8	10	3	11	3
Flow Status - Maint. Flow Volume (10)	7	5	5	8	5
Flow Status - Flashiness (10)	6	2	6	6	4
Channel Alteration (20)	10	11	8	13	6
Frequency of Riffles/Bends (20)*		13		10	
Channel Sinuosity (20)**	6		2		5
<b>Riparian and Bank Structure</b>					
Bank Stability (L) (10)	8	6	5	5	5
Bank Stability (R) (10)	8	6	5	5	5
Vegetative Protection (L) (10)	6	5	7	6	5
Vegetative Protection (R) (10)	6	5	7	6	5
Riparian Veg. Zone Width (L) (10)	5	4	3	1	1
Riparian Veg. Zone Width (R) (10)	3	4	4	1	1
TOTAL SCORE (200):	96	105	70	99	57
HABITAT RATING:	MARGINAL (MODERATELY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)
Date:	9/13/2012	9/13/2012	7/10/2012	9/13/2012	8/29/2012
Weather:	Sunny	Partly Cloudy	Sunny	Sunny	Sunny
Air Temperature:	65 Deg. F.	70 Deg. F.	83 Deg. F.	80 Deg. F.	60 Deg. F.
Water Temperature:	65 Deg. F.	64 Deg. F.	73 Deg. F.	68 Deg. F.	65 Deg. F.
Ave. Stream Width:	35 Feet	10 Feet	9 Feet	10 Feet	4 Feet
Ave. Stream Depth:	0.5 Feet	0.4 Feet	0.7 Feet	0.3 Feet	1 Feet
Surface Velocity:	1 Ft./Sec.	0.8 Ft./Sec.	0.2 Ft./Sec.	0.8 Ft./Sec.	0.9 Ft./Sec.
Estimated Flow:	17.5 CFS	3.2 CFS	1.26 CFS	2.4 CFS	3.6 CFS
Stream Modifications:	Dredged	Dredged	Dredged	Dredged	Dredged
Nuisance Plants (Y/N):	N	N	N	N	N
STORET No.:	190125	190193	290200	290207	290212
Stream Name:	Maple River	Baker Creek	Halterman Creek	Ferdon Drain	Pine Creek
Road Crossing/Location:	Shepardsville Rd	Ovid Street	Wilson Road	Wilson Road	Pierce Road
TRS:	07N01W10	08N01W13	09N02W36	09N02W28	10N03W10
Latitude (dd):	43.0143	43.08134	43.13201	43.132739	43.26276
Longitude (dd):	-84.4253	-84.3871	-84.49745	-84.548455	-84.65493
Ecoregion:	SMNITP	SMNITP	HELP	SMNITP	SMNITP
Stream Type:	Warmwater	Warmwater	Warmwater	Warmwater	Warmwater
USGS Basin Code:	4050005	4050005	4050005	4050005	4050005

\* Applies only to Riffle/Run stream Surveys

\*\* Applies only to Glide/Pool stream Surveys

Note: Individual metrics may better describe conditions directly affecting the biological community while the Habitat Rating describes the general riverine environment at the site(s).

Table 5 cont. Habitat evaluation for the Maple River watershed, 2012.

	Pine Creek	North Shade Drain	Pine Creek	Otter Creek	Maple River
	Hayes Road RIFFLE/RUN STATION 6	Ennis Road RIFFLE/RUN STATION 7	M57 RIFFLE/RUN STATION 8	Taft Road RIFFLE/RUN STATION 9	Tallman Road GLIDE/POOL STATION 10
HABITAT METRIC					
<b>Substrate and Instream Cover</b>					
Epifaunal Substrate/ Avail Cover (20)	4	7	9	4	5
Embeddedness (20)*	9	7	8	6	
Velocity/Depth Regime (20)*	8	8	13	11	
Pool Substrate Characterization (20)**					9
Pool Variability (20)**					11
<b>Channel Morphology</b>					
Sediment Deposition (20)	3	9	13	10	7
Flow Status - Maint. Flow Volume (10)	8	7	6	7	9
Flow Status - Flashiness (10)	4	3	4	4	6
Channel Alteration (20)	6	8	15	13	14
Frequency of Riffles/Bends (20)*	8	7	13	11	
Channel Sinuosity (20)**					13
<b>Riparian and Bank Structure</b>					
Bank Stability (L) (10)	3	5	5	6	5
Bank Stability (R) (10)	3	4	5	6	5
Vegetative Protection (L) (10)	2	3	8	8	8
Vegetative Protection (R) (10)	2	6	8	8	8
Riparian Veg. Zone Width (L) (10)	0	2	7	4	10
Riparian Veg. Zone Width (R) (10)	0	5	8	4	10
<b>TOTAL SCORE (200):</b>	<b>60</b>	<b>81</b>	<b>122</b>	<b>102</b>	<b>120</b>
<b>HABITAT RATING:</b>	<b>MARGINAL (MODERATELY IMPAIRED)</b>	<b>MARGINAL (MODERATELY IMPAIRED)</b>	<b>GOOD (SLIGHTLY IMPAIRED)</b>	<b>MARGINAL (MODERATELY IMPAIRED)</b>	<b>GOOD (SLIGHTLY IMPAIRED)</b>
Date:	8/29/2012	8/29/2012	7/10/2012	7/10/2012	7/31/2012
Weather:	Sunny	Sunny	Sunny	Sunny	Cloudy
Air Temperature:	75 Deg. F.	75 Deg. F.	65 Deg. F.	70 Deg. F.	76 Deg. F.
Water Temperature:	68 Deg. F.	66 Deg. F.	68 Deg. F.	63 Deg. F.	74 Deg. F.
Ave. Stream Width:	15 Feet	12 Feet	20 Feet	9 Feet	100 Feet
Ave. Stream Depth:	0.8 Feet	0.3 Feet	0.8 Feet	0.5 Feet	3 Feet
Surface Velocity:	0.7 Ft./Sec.	0.5 Ft./Sec.	1 Ft./Sec.	0.5 Ft./Sec.	0.2 Ft./Sec.
Estimated Flow:	8.4 CFS	1.8 CFS	16 CFS	2.25 CFS	60 CFS
Stream Modifications:	Dredged	Dredged	None	Dredged	None
Nuisance Plants (Y/N):	Y	N	N	N	N
STORET No.:	290210	290211	290209	290208	190164
Stream Name:	Pine Creek	North Shade Drain	Pine Creek	Otter Creek	Maple River
Road Crossing/Location:	Hayes Road	Ennis Road	M57	Taft Road	Tallman Road
TRS:	10N03W29	10N03W29	09N03W09	09N03W30	05N04W15
Latitude (dd):	43.220473	43.21992	43.17611	43.14713	43.0895
Longitude (dd):	-84.689632	-84.690342	-84.67304	-84.70511	-84.7596
Ecoregion:	SMNITP	SMNITP	SMNITP	SMNITP	SMNITP
Stream Type:	Warmwater	Warmwater	Warmwater	Warmwater	Warmwater
USGS Basin Code:	4050005	4050005	4050005	4050005	4050005

\* Applies only to Riffle/Run stream Surveys

\*\* Applies only to Glide/Pool stream Surveys

Note: Individual metrics may better describe conditions directly affecting the biological community while the Habitat Rating describes the general riverine environment at the site(s).

Table 5 cont. Habitat evaluation for the Maple River watershed, 2012.

	Fish Creek	Fish Creek	Spaulding Creek	Muskrat Creek	Stony Creek
	Pine Grove Road	South of Hubbardston	Dewitt Road	Dexter Trail (N of Price Rd)	Hinman Road
HABITAT METRIC	GLIDE/POOL STATION 11	RIFFLE/RUN STATION 12	GLIDE/POOL STATION 13	RIFFLE/RUN STATION 14	GLIDE/POOL STATION 15
<b>Substrate and Instream Cover</b>					
Epifaunal Substrate/ Avail Cover (20)	7	11	5	7	7
Embeddedness (20)*		11		12	
Velocity/Depth Regime (20)*		13		8	
Pool Substrate Characterization (20)**	7		9		10
Pool Variability (20)**	7		4		5
<b>Channel Morphology</b>					
Sediment Deposition (20)	6	12	3	9	5
Flow Status - Maint. Flow Volume (10)	9	7	9	8	8
Flow Status - Flashiness (10)	7	4	3	7	3
Channel Alteration (20)	10	16	6	9	8
Frequency of Riffles/Bends (20)*		13		11	
Channel Sinuosity (20)**	5		2		4
<b>Riparian and Bank Structure</b>					
Bank Stability (L) (10)	7	2	5	7	5
Bank Stability (R) (10)	9	2	5	5	7
Vegetative Protection (L) (10)	8	8	4	6	7
Vegetative Protection (R) (10)	8	8	4	4	4
Riparian Veg. Zone Width (L) (10)	9	8	2	4	3
Riparian Veg. Zone Width (R) (10)	5	8	2	3	6
<b>TOTAL SCORE (200):</b>	<b>104</b>	<b>123</b>	<b>63</b>	<b>100</b>	<b>82</b>
<b>HABITAT RATING:</b>	<b>MARGINAL</b>	<b>GOOD</b>	<b>MARGINAL</b>	<b>MARGINAL</b>	<b>MARGINAL</b>
	(MODERATELY IMPAIRED)	(SLIGHTLY IMPAIRED)	(MODERATELY IMPAIRED)	(MODERATELY IMPAIRED)	(MODERATELY IMPAIRED)
<b>Date:</b>	7/31/2012	8/29/2012	7/11/2012	7/11/2012	7/11/2012
<b>Weather:</b>	Sunny	Sunny	Sunny	Sunny	Sunny
<b>Air Temperature:</b>	70 Deg. F.	80 Deg. F.	86 Deg. F.	85 Deg. F.	75 Deg. F.
<b>Water Temperature:</b>	58 Deg. F.	68 Deg. F.	84 Deg. F.	79 Deg. F.	71 Deg. F.
<b>Ave. Stream Width:</b>	11 Feet	20 Feet	13 Feet	10 Feet	35 Feet
<b>Ave. Stream Depth:</b>	0.8 Feet	2 Feet	1 Feet	0.5 Feet	0.6 Feet
<b>Surface Velocity:</b>	0.8 Ft./Sec.	1.1 Ft./Sec.	0.4 Ft./Sec.	0.3 Ft./Sec.	0.5 Ft./Sec.
<b>Estimated Flow:</b>	7.04 CFS	44 CFS	5.2 CFS	1.5 CFS	10.5 CFS
<b>Stream Modifications:</b>	Dredged	None	None	Dredged	Dredged
<b>Nuisance Plants (Y/N):</b>	N	N	N	N	N
<b>STORET No.:</b>	590323	340245	190194	190195	190138
<b>Stream Name:</b>	Fish Creek	Fish Creek	Spaulding Creek	Muskrat Creek	Stony Creek
<b>Road Crossing/Location:</b>	Pine Grove Road	south of Hubbardston	Dewitt Road	Dexter Trail (N of Price Rd)	Hinman Road
<b>TRS:</b>	11N05N20	08N05W13	07N02W29	06N03W06	07N04W27
<b>Latitude (dd):</b>	43.3331	43.0865	42.96564	42.93106	42.97026
<b>Longitude (dd):</b>	-84.9448	-84.84568	-84.58186	-84.70537	-84.77925
<b>Ecoregion:</b>	SMNITP	SMNITP	SMNITP	SMNITP	SMNITP
<b>Stream Type:</b>	Coldwater	Coldwater	Warmwater	Warmwater	Warmwater
<b>USGS Basin Code:</b>	4050005	4050005	4050005	4050005	4050005

\* Applies only to Riffle/Run stream Surveys

\*\* Applies only to Glide/Pool stream Surveys

Note: Individual metrics may better describe conditions directly affecting the biological community while the Habitat Rating describes the general riverine environment at the site(s).

Table 5 cont. Habitat evaluation for the Maple River watershed, 2012.

<b>Stony Creek end of Stony Creek Road RIFFLE/RUN STATION 16</b>	
<b>HABITAT METRIC</b>	
<b>Substrate and Instream Cover</b>	
Epifaunal Substrate/ Avail Cover (20)	13
Embeddedness (20)*	13
Velocity/Depth Regime (20)*	13
Pool Substrate Characterization (20)**	
Pool Variability (20)**	
<b>Channel Morphology</b>	
Sediment Deposition (20)	15
Flow Status - Maint. Flow Volume (10)	8
Flow Status - Flashiness (10)	7
Channel Alteration (20)	17
Frequency of Riffles/Bends (20)*	18
Channel Sinuosity (20)**	
<b>Riparian and Bank Structure</b>	
Bank Stability (L) (10)	7
Bank Stability (R) (10)	4
Vegetative Protection (L) (10)	8
Vegetative Protection (R) (10)	8
Riparian Veg. Zone Width (L) (10)	8
Riparian Veg. Zone Width (R) (10)	8
<b>TOTAL SCORE (200):</b>	<b>147</b>
<b>HABITAT RATING:</b>	<b>GOOD (SLIGHTLY IMPAIRED)</b>
<b>Date:</b>	7/11/2012
<b>Weather:</b>	Sunny
<b>Air Temperature:</b>	70 Deg. F.
<b>Water Temperature:</b>	71 Deg. F.
<b>Ave. Stream Width:</b>	40 Feet
<b>Ave. Stream Depth:</b>	0.8 Feet
<b>Surface Velocity:</b>	0.8 Ft./Sec.
<b>Estimated Flow:</b>	25.6 CFS
<b>Stream Modifications:</b>	None
<b>Nuisance Plants (Y/N):</b>	N
<b>STORET No.:</b>	340244
<b>Stream Name:</b>	Stony Creek
<b>Road Crossing/Location:</b>	end of Stony Creek Road
<b>TRS:</b>	07N05W14
<b>Latitude (dd):</b>	42.99086
<b>Longitude (dd):</b>	-84.86714
<b>Ecoregion:</b>	SMNITP
<b>Stream Type:</b>	Warmwater
<b>USGS Basin Code:</b>	4050005

\* Applies only to Riffle/Run stream Surveys

\*\* Applies only to Glide/Pool stream Surveys

Note: Individual metrics may better describe conditions directly affecting the biological community while the Habitat Rating describes the general riverine environment at the site(s).

Table 6. DO monitoring in the Hayworth Creek watershed, July 31, 2012.

Date: <b>7/31/2012</b>									
Site # – Location	RMP	Time Am	Weather	Temp (C)	DO (mg/l)	Time PM	Weather	Temp (C)	DO (mg/l)
23 - St. Johns Big Ditch downstream US 27	0	610	PC	21.56	6.35	1545	PC	23.05	6.75
24 - St. Johns Big Ditch at Walker Road	1.33	806	PC	21.26	5.91	1555	PC	22.74	8.76
25 - St. Johns Big Ditch at Kinley US 27	2.566	826	PC	21.03	5.61	1610	PC	26.65	9.57
26 - St. Johns Big Ditch at Livingston	3.213	838	PC	20.14	6.01	1622	PC	25.71	8.91
27 - St. Johns Big Ditch at West Colony	4.357	849	PC	21.43	1.86	1659	PC	24.94	9.28
28 - Hayworth Creek at DeWitt Road	4.87	900	PC	21.73	5.26	1635	PC	24.84	11.68
29 - Hayworth Creek at Airport Road	5.34	908	PC	21.31	5.36	1645	PC	26.55	16.59

PC - partly cloudy



Table 7. *E. coli* samples collected in the Maple River watershed, 2012. Bold numbers are exceeding either the daily maximum (300 *E. coli*/100 mL) or the 30-day geometric mean (130 *E. coli*/100 mL) Total Body Contact WQS.

Date	LEFT <i>E. coli</i> /100 mL	CENTER <i>E. coli</i> /100 mL	RIGHT <i>E. coli</i> /100 mL	Daily Geometric Mean <i>E. coli</i> /100 mL	Monthly Average <i>E. coli</i> /100 mL
Station 17 Maple River at Shepardsville Road					
8/13/2012	300	290	470	<b>345</b>	
8/20/2012	380	390	420	<b>396</b>	
8/27/2012	430	480	510	<b>472</b>	
9/6/2012	630	980	720	<b>763</b>	
9/11/2012	410	460	460	<b>443</b>	
					<b>465</b>
Station 18 Pine Creek at Luce Road					
8/13/2012	3000	4500	4400	<b>3902</b>	
8/20/2012	790	790	920	<b>831</b>	
8/27/2012	40	110	140	85	
9/6/2012	330	380	350	<b>353</b>	
9/11/2012	110	100	190	128	
					<b>416</b>
Station 19 Hayworth Creek at Hyde Road					
8/13/2012	850	890	700	<b>809</b>	
8/20/2012	250	380	270	295	
8/27/2012	940	630	1000	<b>840</b>	
9/6/2012	560	550	470	<b>525</b>	
9/11/2012	400	300	310	<b>334</b>	
					<b>512</b>
Station 20 Fish Creek at Fenwick Road					
8/13/2012	2200	900	710	<b>1120</b>	
8/20/2012	360	390	290	<b>344</b>	
8/27/2012	400	410	510	<b>437</b>	
9/6/2012	520	410	500	<b>474</b>	
9/11/2012	380	340	340	<b>353</b>	
					<b>490</b>
Station 21 Maple River at Nickel Plate Road					
8/13/2012	1300	1900	1900	<b>1674</b>	
8/20/2012	250	240	300	<b>262</b>	
8/27/2012	560	640	350	<b>500</b>	
9/6/2012	410	360	420	<b>396</b>	
9/11/2012	130	270	280	<b>214</b>	
					<b>451</b>
Station 22 Stony Creek at Tallman Road (d/s)					
8/13/2012	310	380	310	<b>332</b>	
8/20/2012	150	90	120	117	
8/27/2012	260	90	80	123	
9/6/2012	360	440	400	<b>399</b>	
9/11/2012	290	190	190	219	
					<b>211</b>